EMERGENCY NOTES

BY GLENTWORTH R. BUTLER, M.D.

FRONTISPIECE.

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WHAT TO DO IN ACCIDENTS AND SUDDEN ILLNESS UNTIL THE DOCTOR COMES.

BY

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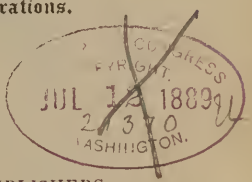
With Eighteen Original Illustrations.



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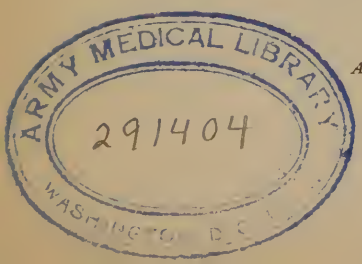

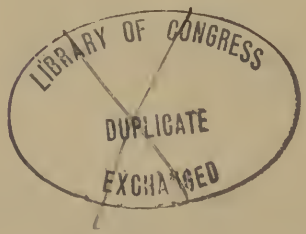

PREFACE.

THIS small volume is the result of some experience in giving courses of lectures to non-medical people. It contains nothing but that which should form a part of the mental equipment of every well-educated man and woman. There is nothing original between its covers except the illustrations. The information contained therein is the common property of the medical profession. I venture to hope, however, that the selection and arrangement of matter is practical and useful. Anatomy and physiology have been introduced only to the extent required for comprehension of a given subject, and immediately preceding that subject. Any further information desired should be sought for in one of the many popular text-books of physiology. In treating of these subjects the great difficulty is to know what to omit.

The use of a manual like this is twofold :

1. As a text-book for societies which make the diffusion of this branch of knowledge their sole aim, or for schools which give it a place in their course of instruction. Subsequently it will con-

stitute a complete set of notes on such a course of lectures.

2. As a book of reference for household use. It is strongly recommended that, in places where no such society or school exists, a physician be secured to deliver four or five lectures on those points which should be personally learned and practised. A class numbering from three to ten may be formed in any community, and the usefulness of such a course will more than compensate for the little trouble involved. It is no small thing to know what to do and how to do it in accidents or sudden illness. A list of the things which should be practically demonstrated will be found immediately preceding the index.

The index has been made ample for the purpose of reference in emergencies, or at other times.

I am indebted to a clever artist of Pratt Institute, and one of her pupils, for putting my ideas for illustrations into shape.

Indebtedness should also be expressed, without detailed acknowledgment, for ideas and hints derived from the handbooks of Esmarch of Germany, Shepherd of England, Morton of New York, and Fowler of Brooklyn, all admirable in their way, especially the latter, which is designed for the guidance of the surgeons and members of the National Guard, State of New

York. But there appeared to be a demand for a manual differing in some respects from those mentioned. Hence this attempt to supply it.

A word or two in regard to the interest which has been shown in this general subject. Courses of lectures were first given by Esmarch of Kiel, who founded in 1882 the "Samaritan Society." It was quickly followed by the "St. John's Ambulance Association" in England. In America the first organization of the kind was the "Society for Instruction in First Aid to the Injured." A branch society was formed in Brooklyn, which has since acquired an independent footing under the name "Red Cross Society of Brooklyn." The latter has done excellent work during its existence. Three years ago "Emergencies" were made a part of the curriculum at the Brooklyn Normal School for Physical Education. One year ago it was made, in connection with lectures on Home Nursing, a department of Domestic Science at Pratt Institute, Brooklyn. These facts are mentioned to show that the utility of such a course of training has been recognized.

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EMERGENCY NOTES.

THE CIRCULATION OF THE BLOOD.

In order to understand the circulation of the blood, it is necessary to know the structure and action of a muscle. Lean meat, as it is found in the butcher-shop, consists almost entirely of muscle. To the unaided eye it is a soft, red mass. Human muscle resembles in its appearance the lean part of beef. In the human body there are several hundred separate muscles, varying in shapeand size. These soft, red masses possess a peculiar power or property termed *contractility*. The term means simply that a muscle is able to shorten and thicken. Most muscles are comparatively long and narrow, and their ends are attached to separate bones. It is evident that when the muscle *contracts*—that is, shortens and thickens, its ends are brought nearer together, and with these ends move the bones or other structures to which they are attached. Take the large muscle on the front of the upper arm, which stands out so prominently when the hand is brought to the

shoulder—the biceps muscle. Like almost all other muscles it is attached, not directly to the bones, but by means of a tendon. A tendon in its typical form is a round, white, glistening cord, very strong, but not elastic—that is, it does not grow longer when pulled upon. Suppose it is desired to bend the arm : the muscle contracts—that is, shortens and thickens, in obedience to the will. As it contracts it pulls upon both tendons. One tendon is attached, in the present case, to an immovable bone—the shoulder-blade ; the other to movable bones—those of the forearm. Consequently the latter yield, and the forearm is brought up toward the shoulder. All the movements and activities of the body are carried on by similar mechanisms, the muscles varying in shape, size, and points of attachment, according to the work required of them. (See Figs. 1, 2.)

It is evident from these considerations that very many of the muscles which form the mass of the body and limbs are under the control of the will. They form a class called voluntary muscles. There are, however, many small muscles which are not controlled by the will—that is, involuntary muscles. They are found forming one layer of the wall of the stomach and intestines, and smaller blood-vessels. The act of breathing is to a large extent involuntary, for if it depended upon the will, one would oc-

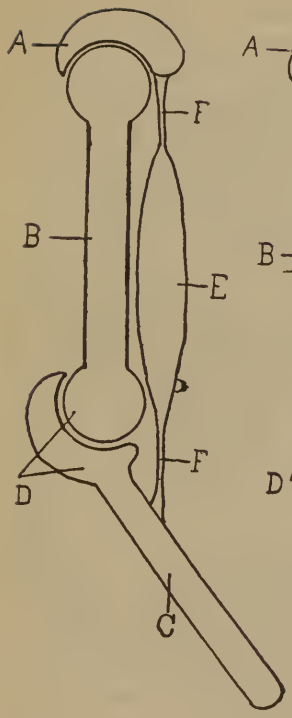

FIG. 1.

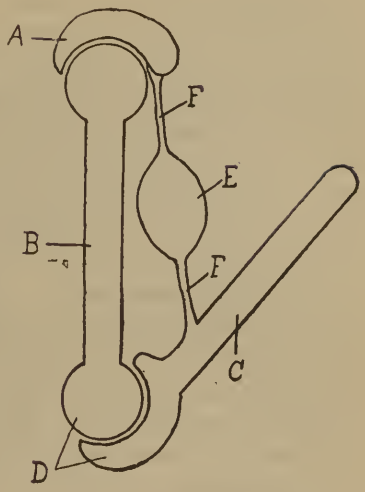

FIG. 2.

Diagram illustrating action of biceps muscle.

In both figures A represents the point of the shoulder-blade, B the bone of the upper arm, C the bones of the forearm, D the elbow-joint, E the biceps muscle, FF the tendons connecting the muscle at each end to the bones.

Fig. 1 represents the muscle at rest. Note shape of muscle E, and position of forearm.

Fig. 2 represents the muscle in action. Note altered shape of muscle E (shorter and thicker), and change of position in forearm.

casionally forget to breathe. But what have these facts to do with the circulation of the blood? Simply this, that the heart is an involuntary, hollow muscle, peculiarly shaped, and arranged to act as a force-pump. It is shaped like a pear, and is somewhat larger than a man's fist. It lies in the chest behind the breast-bone, point downward, and to the left. It is divided, first, into two main cavities, a right and a left. Each main cavity is again divided into two, an *auricle* and a *ventricle*. See Fig. 3, which shows in the simplest form the heart, blood-vessels, and circulation, without reference to special blood-vessels. Off from the *left ventricle* leads a great vessel which sends first two large branches to the head, then one to each arm, and passing down the body, finally divides into two, one for each lower limb. As these branches are followed, they are found dividing and subdividing still further, until they form an interlacing network of the finest and most delicate tubes, much too small to be seen by the unaided eye. Still tracing these fine tubes, they are found joining and running together to form larger ones. These, in turn, unite, until finally two large vessels are formed which enter the *right auricle*. From the *right ventricle* in its turn a great vessel passes to the lungs, divides, subdivides, unites, and finally forms three or four large vessels, which enter the *left auricle*.

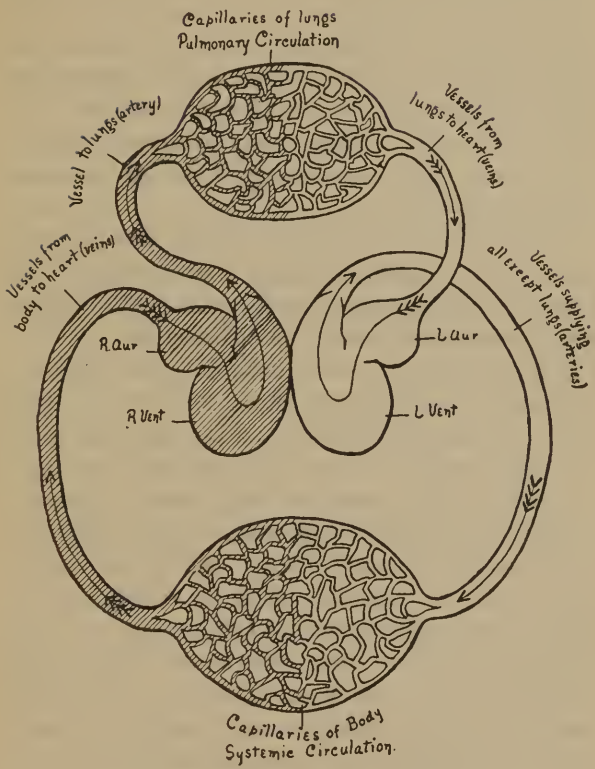

FIG. 3.

Diagram of the circulation of the blood.

A few words now about the blood-vessels. There are three kinds :

1. Arteries. These are the vessels which carry blood *away from the heart.* They are thick and elastic tubes, and have no valves.

2. Capillaries. These are the minute vessels which form the connecting network between arteries and veins.

3. Veins. These are the vessels which carry blood *to the heart.* They are thin-walled, collapsible, and provided with valves which allow the blood to pass in only one direction.

It will be easy now to trace the circulation of the blood, starting with the *left ventricle.* It is filled with bright red blood which has just come from the lungs. Recall the fact that the heart is a living force-pump, which contracts seventy to seventy-five times a minute. Contracting, it sends the blood out through the great artery (*aorta*) and its branches, first to the head and brain, then to the arms, afterward to the body and lower limbs. The blood now passes into the capillaries, and here it shows a striking change of color. Bright red before, it enters from the capillaries into the veins dark blue in color. The red tint was due to the presence of oxygen, and the absence of impurities. While passing through the capillaries the tissues of the body robbed it of its oxygen and added an impurity—carbonic acid gas. Hence its change of

color. Through the veins back to the heart it flows, entering the *right auricle*, from this to the *right ventricle*, and then through a great artery to the lungs. In the capillaries of the lungs it casts off the impure carbonic acid gas, absorbs oxygen, becomes again bright red and pure, and returns to the *left auricle*, and *ventricle*, to take a new start. So well does the heart perform its task, that all the blood in the body makes its round at least once every minute.

Why does the heart invariably pump the blood in the same direction? Because in the heart, between auricles and ventricles, and at the openings where the great arteries begin, are valves or trap-doors, so arranged that the current must always flow in the same course.

Studying carefully the diagram in Fig. 3, the course of the blood may be summed up as follows:

From the left ventricle through a great artery (*aorta*) to the capillary system of the body; from these capillaries to the right auricle; right auricle to right ventricle; right ventricle to lungs and their capillary system; lungs to left auricle; left auricle to left ventricle, the place of beginning.

The circulation from heart to lungs, and lungs to heart, is sometimes called the lesser, or pulmonary circulation.

The circulation from heart to body, and body

to heart, is sometimes called the greater, or systemic circulation.

It is at times very necessary, in cases of severe bleeding, to know the exact location of the larger arteries ; for an artery is an elastic tube, and if it is pressed upon at the right place, and with the proper amount of force, it is evident that the flow of blood through it may be stopped, just as one might pinch a rubber tube through which water was running. The following list shows the arteries which should be studied. It is impossible to learn these facts without the personal aid of a physician, or other person familiar with anatomy, who can show you the exact place where the vessel may be compressed :

Arteries.	Landmarks.	Point of Compression.
Of neck. (*Carotid.*) . .	Large muscle of neck....	Against spine.
Collar-bone artery. (*Subclavian.*)	Middle of collar-bone. (*Clavicle.*)	Against first rib.
Artery of upper arm. (*Brachial.*)	Biceps muscle	Against upper arm-bone. (*Humerus.*)
Arteries of forearm. (*Radial*, toward thumb ; *Ulnar*, toward little finger.)	Each side front of wrist.	Against bones of forearm at wrist. (*Radius*, *Ulna.*)
Of thigh. (*Femoral.*)	Between middle line of body in front, and projecting point of hip-bone. (*Symphysis*, and *Anterior Superior Spinous Process.*)	Against front of hip-bone.

BLEEDING OR HÆMORRHAGE.

The word hæmorrhage is a technical term, and means simply, bleeding in general, from any source or cause. It is evident that bleeding may occur from three sources, according to the kind of vessel which has been wounded. It is possible also to determine the source of the blood by its color, and the manner in which it flows. Thus there are three varieties of bleeding :

1. Arterial. The blood from a wounded artery is bright red. It flows in jets, each jet or spurt corresponding to a contraction of the force-pump propelling it, which is the heart.

2. Capillary. The blood from wounded capillaries is also bright red, but oozes out gradually, very much as perspiration appears on the face or hands on a hot day.

3. Venous. The blood is blue or purple when issuing from a wounded vein, and flows in a steady, uniform stream.

In *very slight wounds or injuries* the bleeding is almost entirely from the capillaries. These vessels are so numerous and so small that the point of a needle thrust into the skin at any point will wound them, as shown by the escape of a minute drop of blood.

In *severe wounds* the bleeding is of all three kinds, arteries, veins, and capillaries having

been severed. As a rule, in these severe wounds, it is the arterial bleeding which requires attention, and hence the importance of being able to recognize it. Almost the only example of purely venous bleeding is caused by the rupture or bursting of enlarged (*varicose*) veins in the leg.

As a matter of fact many cases of bleeding stop spontaneously without treatment. Naturally one should know how nature accomplishes this result, even when the hæmorrhage is from an artery.

1. Take the case of an artery which has been cut across. Study further the structure of an artery. Its wall is composed of three layers or coats—an outer, a middle, and an inner. It is, as a whole, an elastic, rubber-like tube, kept in a state of fulness or distension by a fluid—the blood—which is constantly being pumped into it by the heart. It is on the stretch sidewise and lengthwise. When it is cut it suddenly contracts—that is, grows smaller. It also retracts —that is, grows shorter and draws back. At the same time the inner coat, which is the thinnest, curls up inside the vessel. The combined result of these changes is to make the opening at the cut end much smaller, and by so much hinder the escape of blood. At this point an important property of the blood comes into play. Inside the vessels under usual circum-

stances it is a fluid. If it gets out, or if the walls of the vessels are injured, it clots or coagulates —that is, becomes semi-solid, like a firm jelly. In this instance it clots firmly in the artery, and in the wound itself, plugging the open end of the vessel, and the bleeding is stopped. (See Fig. 4.) There is still another agency which

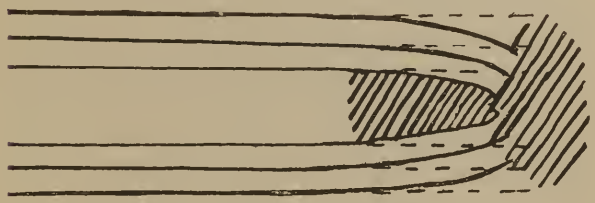

FIG. 4.

Diagram showing the arrest of bleeding from a severed artery. The dotted lines show the original shape and size of the vessel. The solid lines show the contraction (growing smaller), retraction (growing shorter), and curling in of the inner coat. The shading shows the clot (plug) formed in the end of the vessel, and clot in the wound pressing.

may have the desired effect. If much blood is lost fainting is caused. This means that the action of the heart is weakened. If the action of the heart is weakened the blood is pumped through the vessels with lessened force, and time is afforded for the formation of a clot. It is in this way that men left on a battle-field have recovered from wounds of large arteries.

But this fortunate termination is the exception. The facts are, that only in the *smallest arteries* are the natural processes often sufficient.

In *medium-sized arteries* hæmorrhage is sometimes stopped by nature, but almost invariably requires aid, the force and size of the stream being such that a clot has no chance to form.

In the *largest arteries* the force and size of the stream is yet greater. The loss of blood is sudden and large, causing death almost immediately.

2. In the capillaries the vessels are small and the force of the stream slight, so that clotting promptly occurs. The one exception to this statement is found in certain families—fortunately few in number—called "bleeders." In these people the blood does not clot, and they have been known to die of long-continued hæmorrhage from a slight cut, or the extraction of a tooth.

3. In veins. These vessels collapse easily as a rule, and the force of the current is not great. Both of these conditions allow quick and easy clotting of the blood.

MEANS FOR STOPPING HÆMORRHAGE.

1. Elevation. If, for instance, the hand has been cut, it should be raised high above the head. In this position the blood has to travel an uphill road, and it reaches the hand with less force than if the hand were hanging at the

side. Lessened force means a slower escape of blood, and a quicker clotting in the wounded vessels. This instance will explain the utility of raising the bleeding part, whenever possible, above the level of the heart.

2. Cold and heat. Cold of a certain degree and heat of a certain intensity have a similar effect upon the blood-vessels, especially small arteries, in causing them to contract. Cold water, ice, or ice-bags applied to a wound tend to stop bleeding. Hot water at a temperature of 115° to 125°, which is as hot as can be comfortably borne by the hand, has a similar action, and does not depress the patient. Lukewarm water increases bleeding.

3. Styptics. Styptics are substances such as iron, alum, and tannin, which pucker up the bleeding surfaces, just as they pucker the tongue when held in the mouth. Cobwebs packed into the wound is a popular method of treatment, which may be classed under this head. These means are mentioned but to be condemned. They are useful only in capillary bleeding, which can be easily checked by pressure, and all of these means, especially the use of cobwebs, soil the wound and greatly hinder its healing. The only thing which should ever be used as a styptic on a wound is a mixture of one part of vinegar to four parts of water.

4. Pressure directly on wound by,

a. The fingers. This is the simplest and most natural method of stopping bleeding from all wounds in which the bleeding is severe. It will, with very rare exceptions, check hæmorrhage temporarily until other more permanent means can be used. Many lives have been lost from ignorance of this simple expedient. Lay one finger above and one below the wound close to its edges, crowd the edges together, and make pressure,

b. By compress and bandage. A compress consists of soft material (see section on bandages and dressings), clean linen, muslin, or cheese cloth, folded into suitable shape and size, laid upon the wound, and bound firmly on by a bandage.

5. Pressure on artery above wound,

a. By the fingers. Knowing the course and location of the artery, and the exact point at which pressure should be made, it will be an easy matter to stop the flow of blood through the vessel. The amount of pressure required will be very slight, if properly applied, as a personal experiment will prove.

b. By an improvised tourniquet. This may consist of an elastic cord or band, like a rubber tube or a suspender, wound tightly round and round a limb above the point of injury, until the vessels are compressed sufficiently to stop the flow of blood. More commonly a handker-

chief is employed. Tie this around the upper arm, for instance, loose as regards the arm, tight as regards the knot. Pass through the handkerchief a stick, pencil, or penknife, and twist in such a manner as to tighten the loop of the handkerchief around the arm, continuing to tighten until the bleeding ceases. (See Fig. 16, left arm.) This pressure may be continued for at least an hour without injury, longer if necessary in an emergency. This and the previous expedient can only be employed in wounds of the limbs. Bleeding from wounds of the body must be treated by pressure on the wounded point.

6. For the permanent stoppage of bleeding from wounded arteries and veins, the surgeon employs ligatures—silk or catgut threads tied around the cut end of the vessel, just as one would tie up the end of a rubber tube.

7. To stop hæmorrhage from a ruptured varicose vein which usually occurs in the leg. Place the patient on his back, raise the limb and rest it on pillows. Remove garters, if above point of rupture. This should be done, because the flow in the veins is upward toward the heart, and it should not be hindered. If so, the veins below become full of blood. Then bind a compress directly on the bleeding point and the hæmorrhage will be promptly and easily stopped.

Do not give stimulants in any case of hæmorrhage until the bleeding has been permanently stopped. Stimulants increase the force of the heart's action and thereby tend to delay clotting.

(*Pressure on wound, application of compresses, pressure on arteries, and improvised tourniquet, should be personally practised under the direction of a physician, or other competent person.*)

This consideration of hæmorrhage naturally leads to a similar study of the most common cause of bleeding – namely,

WOUNDS.

Wounds are divided into three kinds, with reference to their cause : *Incised, Lacerated and Contused, Contusions.*

Incised wounds.—An incised wound is one made by a sharp-cutting instrument, as, for instance, a finger cut with a keen penknife. Its edges are clean-cut, its surface smooth. Of all wounds the incised wounds are apt to bleed most freely, because the vessels are cleanly cut and do not favor the clotting of the blood.

Lacerated and contused wounds.—These wounds are made by a tearing or bruising instrument, for example, catching the hand on a nail, or breaking through the skin with a blow from a hammer. The edges and surfaces of these

wounds are rough and ragged. As a rule, they bleed but little.

Contusions.—A contusion is simply a bruise caused by a blow from some blunt instrument. The skin is not torn through. It is really a wound under the skin (*subcutaneous*). Numberless capillaries are ruptured, and the blood escapes from them into the surrounding tissues, thus causing the familiar black and blue appearance of a bruise.

THE MODE OF HEALING OF WOUNDS.—Wounds heal in two ways :

Primary union, or first intention.—This is by far the most desirable manner of healing, and occurs mainly in incised wounds. If the edges of a wound are clean-cut, brought closely in contact and kept there, the wound will heal quite firmly in three or four days. No better illustration can be used than to say that it heals as if the edges and surfaces had been glued together immediately after the injury. (See Fig. 5, A.)

Secondary union, or second intention (by granulation).—This mode of healing occurs mainly in lacerated and contused wounds. In these wounds there is either actual loss of tissue, or the tissues are so ragged and bruised that it is equivalent to such loss. The destroyed tissue or flesh has to be replaced. If you examine a wound of this kind three or four days after it occurred, you will see the bottom of the wound

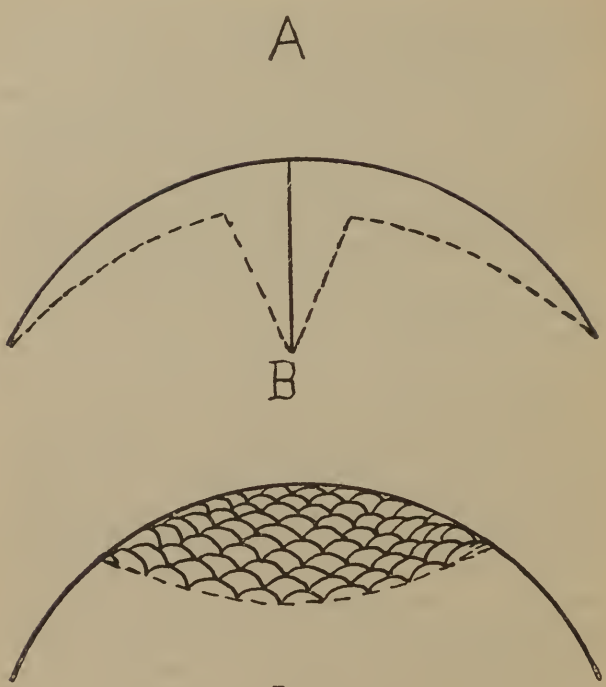

FIG. 5.

Diagram representing healing of wounds.

A. Primary union, or first intention.

Dotted line represents wound gaping open.

Solid line represents same wound as healed.

The vertical line representing the line of union.

B. Secondary union, second intention, or by granulation.

Dotted line represents extent of original wound. Absolute loss of tissue.

Solid line represents same wound filled with granulations, and covered with new skin.

covered with small red elevations, coated perhaps with a layer of creamy matter. Day by day as you watch it you see these red elevations, termed *granulations*, increasing in number and gradually filling up the wound. As soon as they reach the level of the skin, and not till then, the skin begins to grow from the edges to the centre, until finally the newly-formed tissue is covered by newly-formed, thin, and whitish skin. The whole of the new tissue forms the scar with which every one is familiar. (See Fig. 5, B.) The scar from a wound healing by first intention is narrow and line-like, that from healing by second intention varies in shape and size, according to the shape and size of the original wound. In primary union the time of healing is short—three or four days. In secondary union the time required varies from a week or ten days to many weeks, according to circumstances.

There are certain things necessary to healing by first intention. They are also necessary to safe, although slower, healing by second intention.

Hæmorrhage must be stopped. The edges of the wound must be brought together and kept there.—The necessity for so doing, if you wish to obtain union by first intention, is evident. Unless the edges of the wound are in contact the so-called gluing process cannot occur. Even in wounds which cannot heal by first intention, it is an ad-

vantage to have the size of the wound reduced by bringing the edges of the wound together as closely as possible.

The injured part should be put and kept at rest.—Movement and disturbance of the parts hinders the healing process. A cut on the finger, unless protected, will heal slowly, because it is constantly being torn open and irritated.

Drainage.—This means that if there is to be any discharge from a wound, some method must be used to let it escape as fast as formed. This can only be done by the surgeon. He will use commonly, rubber tubes of various sizes, which are inserted into all wounds of any size, to carry off fluids which ought not to remain. If they do remain, they separate the surfaces of the wound, and cause painful delay in healing.

Antisepsis.—This is the most important of all requirements for the proper and safe healing of wounds. The word antisepsis means "anti-poisoning." As used here, the term signifies absolute cleanliness and purity of a wound. There are two kinds of dirt with which the surgeon must contend. One kind is the dirt which is visible to the unaided eye, for example, dust, pieces of clothing, soil, grime, bits of glass, etc. The other and the more dangerous kind of dirt consists of microscopic living particles, called *germs*, or *bacteria*. They float to a certain extent in the air, but cling mainly to ob-

jects of all kinds—hands, clothing, furniture, etc. If they get into wounds and find a suitable soil or resting-place, they begin to multiply and increase greatly in number. Their mere presence is irritating to the tissues of the body, but in addition, while multiplying, they form poisonous substances which have a very unpleasant effect both upon the wound and the whole body. By their presence and products they may and do cause inflammation, formation of matter (*suppuration*), erysipelas, and certain forms of blood-poisoning. How, then, can we prevent mischief from such a cause? Simply by remembering that they are living particles. By years of delicate and careful experimenting, certain substances have been found which will either kill or benumb these germs, stop their growth and render them harmless. The substances which kill germs are called *germicides*, those which benumb them and hinder their growth are called *antiseptics*.

The best example of a germicide is a solution of corrosive sublimate, one part to two thousand parts of water. As this is very poisonous, if taken internally, and is not likely to be at hand in an emergency, we must depend upon the antiseptics which can be procured more or less easily. These are, carbolic acid, salt, and vinegar, which may be used in solutions of the following strengths:

a. Carbolic acid. Three teaspoonfuls to one pint of water.

b. Table or kitchen salt. One tablespoonful to one pint of water.

c. Vinegar. One tablespoonful to four of water.

By washing the wound and wetting the compress to be bound upon it in one of these solutions, you may feel quite sure that you have prevented the troubles which may arise from the presence of germs.

For practical purposes the facts hitherto stated in regard to wounds and bleeding should be condensed and arranged so as to furnish a set of rules applicable to the proper treatment of wounds, and bleeding therefrom, as they might be met with in actual cases. Hence the following

DIRECTIONS FOR THE TREATMENT OF WOUNDS AND BLEEDING FROM THEM.

A. In *trivial wounds*, or *large wounds with slight hæmorrhage*, or *where hæmorrhage has stopped before seeing the case.*

1. Wash with antiseptic solution. Do not disturb clot if previous hæmorrhage has been large.

2. Make a compress, wet it in an antiseptic solution, and apply with bandage.

If bleeding is severe at the time of seeing the

case, the rules given above must be modified and added to. Therefore, in

B. *Large* or *small wounds with much hæmorrhage*,

1. Cut away clothing so as to expose the part.

2. Make pressure with the fingers on both sides of the wound, above and below, elevating the part at the same time, if a limb. In the mean time, still continuing the pressure,

3. Secure, if possible, clean material for compress and bandage, and also one of the antiseptic solutions to wet them with. If the case is urgent, obtain any kind of material, dispense with the antiseptic, and,

4. Prepare a large compress and bind it in and on the wound *firmly* with a bandage.

5. If bleeding still continues, make finger-pressure on the artery above the wound.

6. If this, again, is not effectual, use the improvised tourniquet. (See Fig. 16, left arm.)

The last two methods are not available in wounds of the body or trunk. One must trust to pressure with fingers or compress.

Contusions or bruises, which, you will remember, are wounds under the skin, require very simple treatment. The blood which escaped from the capillaries is slowly absorbed, changing color in the process, from blue-black to green, and fading into a light yellow. A black eye from a blow is a comparatively frequent ex-

ample of a contusion. As to treatment: Hot fomentations to the part will hasten the disappearance of the color. These should consist preferably of old towels or pieces of old flannel, wrung out of very hot water, and applied to the part for a half hour at a time. During this time they should be frequently re-dipped in the hot water. If cooling applications are preferred on the score of convenience, either of the following may be used by wetting linen or muslin cloths and binding them on the part. They should be kept moist: Alcohol and water, equal parts. Alcohol, vinegar, and water, equal parts. Pond's extract (witch hazel). A teaspoonful of laudanum to a cup of water.

POISONED WOUNDS.

The term refers to the bites of rabid or venomous animals. Included under this head are the wounds inflicted by the bite of a snake, or a mad dog or cat. Stings of insects are small poisoned wounds.

Treatment.—This must vary in severity and extent, as follows:

a. If the bite is judged to be only *slightly poisonous*, or, if *doubtful*,

1. Provided the wound is on a limb (finger, toe, arm, leg), tie *immediately* a string, cord, or handkerchief twisted into a cord tightly around the limb just above the wound. This will pre-

vent the entrance of the poison into the circulation, as it cannot pass above the ligature.

2. Draw the poison from the wound by means of suction with the mouth. Even the venom of snakes is harmless when taken in the mouth, unless there is a scratch or wound of the lips or mouth.

3. Bathe the part freely in warm water, or, better still, an antiseptic solution, preferably carbolic acid.

b. If the bite is known *positively* to be *dangerous* or *fatal*, use the ligature and suction as before. In addition,

1. Make a cross-cut through the centre of the bite with a penknife. This will encourage bleeding, which tends to wash the poison away. It also exposes the wound more thoroughly for the next step in treatment, which is

2. Cauterization. This measure is, of course, painful and apparently brutal. It should be remembered, however, that the bite is almost invariably fatal and a human life is at stake. You have a choice of means. The best is the use of pure nitric acid. Dip the end of a match, or splinter of wood into the acid and thrust it repeatedly into the depth of the wound, so as to bring the acid in contact with every part of its surface. Pure carbolic acid may be used in the same way. If these are not at hand, a knitting-

needle, piece of wire, or knife-blade may be heated, and the wound thoroughly seared.

3. Give stimulants—brandy, whiskey, or wine—in large doses, not enough, however, to produce intoxication. Aromatic spirits of ammonia, a teaspoonful in a wineglass of water, may be given every fifteen minutes.

If bitten by a dog do not allow the animal to be killed. By waiting it will be ascertained if the dog is really mad, and many days of anxiety and worry will be spared.

For the *stings of insects*, bind on a compress wetted with carbolic solution, or, better, household ammonia.

We have spoken of wounds and of bleeding from obvious injury. Other kinds of hæmorrhage occur not due to obvious injury or violence. The difference is more apparent than real, as in all cases bleeding depends upon the fact that the vessels are in such a condition that the blood can escape from them, and it matters not in reality whether the injury is produced slowly by disease, or quickly by sudden violence. For convenience in treatment, however, we speak of these hæmorrhages under separate heads.

BLEEDING FROM THE NOSE.

This is the most frequent and the least dangerous of these hæmorrhages. It is usually due to

rupture of some capillaries in the membrane lining the nose, more rarely to ulceration of a small artery. Capillary rupture may be caused by violent exercise. It may occur in heart disease and congestion of the brain. It is sometimes caused by disordered conditions of the blood, and is especially frequent in typhoid fever. The blood generally comes from one nostril, and from a point on the partition between the two nostrils, on a level with the lower edge of the nose bone, so that the tip of the finger can reach it.

Treatment.—Let the patient sit upright. Leaning forward with the head low increases the bleeding. Raise the arm on the bleeding side. Take two towels and wring them out of cold, preferably ice-water. Wrap one around the neck. Lay the other properly folded over the forehead and upper part of nose. A greater degree of cold may be obtained by wrapping finely cracked ice in the folds of the towels. As stated before, cold causes the vessels to contract. If bleeding still continues, snuff up from the hand, or inject with a small syringe, either ice water, or ice-water and alum, a teaspoonful of alum to a cup of water. If these means fail, take a piece of cotton wool as large as the first joint of the thumb, tie a thread around its middle, soak it in the alum-water, or, if that is not at hand, oil it with sweet oil or vaseline, and

plug the nostril. This is best done by pushing in the cotton with a screwing or twisting motion, until firmly lodged. The thread serves to draw it out when required.

BLEEDING FROM GUMS.

This can be stopped by rinsing the mouth freely with alum and ice-water.

BLEEDING FROM THE STOMACH.

This is caused by ulcer, cancer, inflammation, or corrosive poisons. Sometimes it occurs without apparent cause. The symptoms are these. First, a feeling of fulness at the pit of the stomach. Then follows pallor of the face, disturbance or dimness of sight, finally nausea and vomiting of fluid blood. If the blood has escaped from the vessels into the stomach very suddenly, it appears bright red. If it has escaped slowly and remained in the stomach for some time, it looks like coffee grounds. Blood is an animal substance. If it stays in the stomach for a sufficient length of time it is partially digested, and in this condition has the appearance of coffee grounds. In a case of this kind remember that there may have been nose-bleed, or bleeding from the gums. This blood, especially during sleep, may have been swallowed, and afterward rejected by the stomach. It is necessary also to decide whether the blood

comes from the stomach or from the lungs. Remember, then, that

In bleeding from the stomach, the blood is *vomited*, and is either *bright red*, or *coffee-ground*, not frothy.

In bleeding from the lungs, the blood is *coughed up*, is *bright red* and *frothy*.

Treatment.—Calm the patient, if possible, for excitement causes increased heart action and a greater amount of bleeding. Let cool air into the room. Give the patient small bits of ice to swallow. Take a teaspoonful of vinegar and add to it four teaspoonfuls of ice-water. Give the patient a teaspoonful of this mixture every ten or fifteen minutes. Nothing else should be swallowed, and no stimulants should be given.

BLEEDING FROM THE LUNGS.

This is caused sometimes by disease of the heart, but most commonly by diseases of the lungs, especially consumption. It is very rarely, if ever immediately fatal, excepting, possibly, in the last stages of consumption. It is not, therefore, an event which should cause fear of immediate death. It is important mainly as a symptom of disease. The way of distinguishing between bleeding from lungs, and from stomach, has been given in the preceding section.

Treatment.—Reassure the patient, which you may conscientiously do. Admit cool air. Let

the patient sit or recline. He should not lie flat. Apply cloths wrung out of cold water to the chest and neck. Bits of ice should be swallowed. Let him *eat* a teaspoonful of salt, or wash it down with water. If a physician cannot be procured, you may give a teaspoonful of spirits of turpentine in a tumbler of milk. Do not give stimulants.

THE BONES.

In order to gain an intelligent idea of the temporary treatment of fractures, one should have, at least, an outline knowledge of the skeleton and the bones composing it. The skeleton consists of all the bones of the body taken as a whole. The bones give firmness and rigidity to the body. They form the frame-work upon which the soft parts are moulded. Indirectly they constitute the means by which we are able to perform various movements of the body and limbs, for it is the bones to which the muscles are attached. The bones, therefore, form levers by which movement is effected. Moreover, they form cavities or enclosed spaces, which contain and protect the more delicate and important organs, such as the brain, the eyes, or the heart.

The skeleton, for purposes of study, is divided into the head, the trunk, and the extremities or limbs.

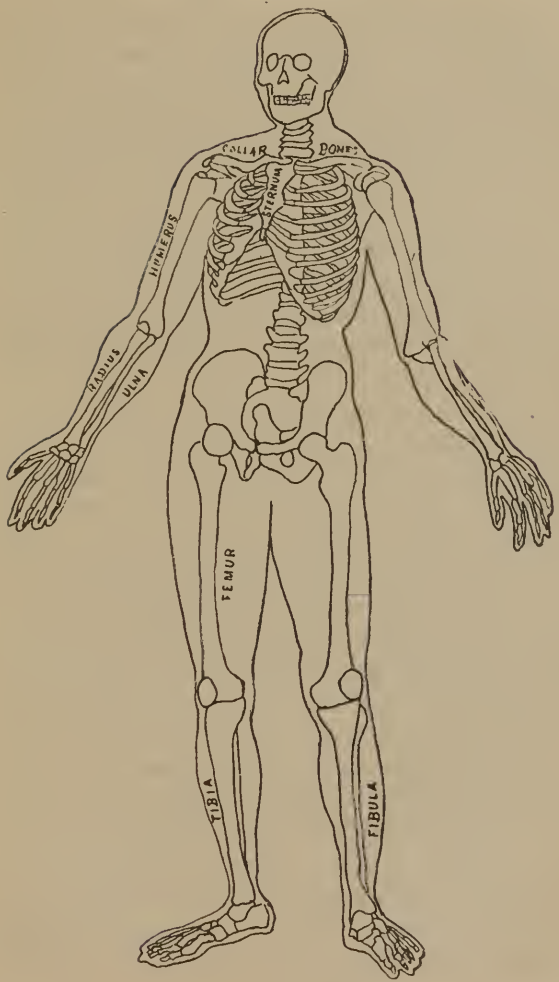

FIG. 6. The Skeleton.

(*It is impossible to gain a correct idea of the shape, size, and relations of the bones and joints without seeing and examining the actual skeleton. Illustrations and drawings, while by no means useless, are of little service compared to personal observation and practice. These remarks apply also to the use of splints and dressings. The remainder of this and the two following sections constitute little more than an attempt to suggest the leading points, which should be the subject of practical study under the guidance of a physician, or other competent person.*)

The Head.—The head is further divided into skull and face. The bones forming the upper part of the skull are flattened and immovably joined by their edges, constituting the roof of a cavity. The bones of the lower part of the skull and of the face are irregular in shape and also firmly knit, with one exception—viz., the lower jaw, which is movable. They form the floor of the cavity, and this cavity contains and protects the brain and organs of special sense.

The Trunk.—The trunk is formed by the spine, ribs, breast-bone, and pelvic bones. The spine is composed of a number of separate bones piled one on top of the other, so that they form a column. Each bone is called a *vertebra* (plural, *vertebræ*). Between each and its neighbor is interposed a layer of rubber-like substance called *cartilage*. The spine is not straight, but has

several curves. Being composed of alternate blocks of hard bone and layers of rubber-like cartilage, it has the important property of flexibility—that is, the power of bending. This arrangement also prevents jarring of the brain in walking and jumping. At the same time it is sufficiently rigid to sustain the weight of the trunk and head. Through the centre of the spinal column runs a canal, in which lies the spinal cord, composed of nerves on their way to different parts of the body.

The Ribs and Breast-bone.—The ribs are long, narrow, curved bones, running from the spine behind to the breast-bone (*sternum*) in front. With the latter they form a cavity, the chest, which contains the heart, lungs, and great blood-vessels. At the back the ribs are jointed directly to the spine, and have but little range of movement. In front they are connected to the breast-bone by strips of cartilage. It is by means of these cartilaginous junctions that the ribs have the power of movement during the act of breathing. Otherwise, the chest would be a box, with rigid, immovable walls. At the base of the chest is attached a muscular membrane (*diaphragm*), which forms a partition between the chest and the *abdomen*. The abdomen contains the stomach, intestines, liver, spleen, etc.

The Pelvic or Haunch-bones.—These are strong,

thick bones, enclosing a cavity called the *pelvis*.

The Extremities or Limbs.—The arm and shoulder, or upper extremity, consists of the collar-bone (*clavicle*), the shoulder-blade (*scapula*), the upper arm bone (*humerus*), the forearm-bones, two in number (*radius* and *ulna*), small bones of wrist and hand. The lower extremity or leg comprises the thigh-bone (*femur*), the knee-cap (*patella*), two leg-bones (*tibia* and *fibula*), small bones of ankle and foot.

Joints are formed by the junction of two or more bones. The surfaces of the bones in contact are covered with a thin layer of cartilage. Between the cartilaginous surfaces is placed a thin-walled sac, the inner surface of which secretes an oily material, so that the joint-surfaces will move smoothly upon each other. The bones forming the joint are held together by strong but flexible bands called *ligaments*. There are three kinds of joints. Immovable, as in the skull ; ball and socket, as in the shoulder and hip ; hinge-joints, as in the elbow and knee.

FRACTURES.

Fracture is the breaking of a bone. As to direction a fracture may be *transverse*, at right angles to the greatest length of the bone, or *oblique*, at an acute angle to the greatest length. The character of the fracture may be,

Simple.—This is a break of a bone without a wound of the skin or flesh.

Compound.—In addition to the break there is a wound leading down to the point of fracture. The wound may be caused by the sharp end of a broken bone being thrust through the skin, or by the same force which produced the fracture.

Comminuted.—This means that the bone is broken in more than one place.

How do fractures heal? Healing proceeds very slowly for the first four or five days. A jelly-like material forms *around the ends*, *between the ends*, and *inside the marrow canal* of the bone. This gradually hardens, and is finally transformed into new bone. This mass of new material is called *callus*. (See Fig. 7.) Its size depends upon the extent to which the broken ends of the bone remain out of their natural position. In the course of months or years the callus disappears by absorption, leaving the bone about as strong as before. The time required for the healing of a fracture varies from two to six weeks, according to the size of the bone. It is much more rapid in children than in adults.

Signs of fracture.

1. Deformity. On comparing a fractured bone with the uninjured one on the opposite side of the body, it is noticed to be out of shape and deformed. The deformity is due to swelling of the soft parts, but mainly to displacement of the

ends of the bone. For instance, in a fracture of the upper arm-bone, the broken ends slip past each other, thus causing distortion.

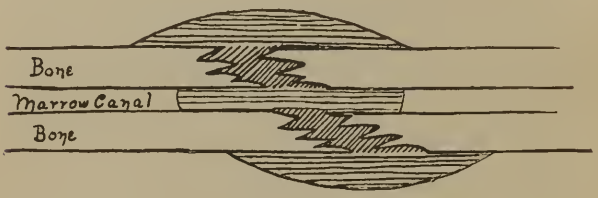

FIG. 7.

Diagram representing the healing of a fracture.
The shaded portion shows the callus. Note that it forms around, between, and inside the narrow canal of the bone. Callus disappears to a great or less extent by absorption.

2. Abnormal mobility. On gently moving the limb the bone bends unnaturally. In other words, a joint is found where it ought not to be.

3. Crepitus. The same movement of a broken limb which shows abnormal mobility will frequently produce a clicking or grating sensation. This sensation is called *crepitus*, and is caused by the rough surfaces of the broken bone rubbing against one another.

Having decided that a fracture exists by finding one or more of these signs, the physician sets (*reduces*) the broken bone. This means that he puts the ends of the bones into proper position by manipulation and pulling. He then en-

deavors to *keep* them in proper position, by means of splints, until they knit. Splints usually consist of some rigid or firm material, such as felt, plaster-of-paris, or strips of wood, properly padded, according to the nature and location of the fracture. The broken ends cannot always be kept in proper position, because in some fractures they tend to become displaced by the action of the muscles attached to the bones. This is especially the case in fractures of the upper arm-bone and the thigh-bone. The usefulness of a limb is sometimes unavoidably diminished by the presence of a large callus, and its interference with motion by its position and pressure upon the nerves. Compound fractures are especially serious, because there is added to the fracture a wound of a very disagreeable nature.

THE TEMPORARY TREATMENT OF FRACTURES.

In compound fractures the wound should immediately receive proper treatment by applying compress and bandage wet with an antiseptic solution. Afterward treat it as a simple fracture. In a simple fracture,

1. There is no great haste necessary, therefore, *if patient does not require to be moved*, simply make him as comfortable as possible by propping the injured limb with pillows or cushions, and apply cloths wet with cold water. But

2. *If patient must be moved, or travel some distance*, apply temporary splints or dressings to prevent further injury from movement.

In city or country one of the following list of materials may usually be found, and, by the aid of a little ingenuity, utilized for temporary dressings :

For Splints.—Cigar-boxes, pasteboard (boxes, book-covers). folded newspapers, shingles, barrel-staves, umbrellas, walking-sticks, rulers, paper-cutters, branches, twigs, straw, fence-palings, spoons, tongs.

For Padding.—Cotton, flannel, towels, flax, jute, oakum, hay, moss, piece of blanket, coat-sleeves or stockings stuffed with grass, hay, straw, or leaves.

For Bandages.—Handkerchiefs, stockings, garters, suspenders, sheets, blankets, and patient's clothing torn into strips.

The temporary treatment of the following special fractures should be studied and personally practised. Some of these improvised splints and their application are shown in Fig. 8, and in Frontispiece, left leg. See also section on bandaging.

Jaw-bone.—Four-tailed bandage.

Collar-bone.—Broad bandage around chest and arm of injured side. Broad arm-sling.

Upper Arm-bone.—Two splints. Narrow arm-sling.

FIG. 8.

Improvised splints and dressings for fractures of jaw, upper arm, forearm, thigh-bone, and leg.

Forearm and Wrist-bones.—One splint reaching to base of fingers. Broad arm-sling.

Ribs.—Broad bandage around chest, applied during expiration—*i.e.*, chest emptied of air.

Thigh-bone.—Preferably a long, posterior (back) splint, reaching from waist to heel. If this cannot be secured, simply tie limbs together.

Leg and Ankle-bones.—Internal (inside) splint, or tie limbs together.

DISLOCATIONS.

A dislocation is a displacement of the joint ends of one or more bones from their proper position. The ligaments are necessarily torn.

Signs of a dislocation.—1. Alteration in shape. Compare with opposite side.

2. Much pain on attempted movement.

3. Abnormal immobility. There is no joint where there should be one.

Dislocations should always be treated by a physician, as much damage may be done to blood-vessels and nerves by unskilful handling. They differ from fractures in one respect, that the sooner they are reduced, the better it will be. Hot fomentations should be applied while waiting.

SPRAINS.

Ligaments, the bands which hold the joint-bones together, are flexible but not elastic. They will bend easily, but will not lengthen when pulled upon. They may be cut without causing pain or subsequent disturbance; but if they are overstretched and torn, pain and swelling quickly occur. A sprain is a sudden overstretching and tearing, not only of the ligaments forming a joint, but also of the tendons and muscles around the joint. In bad cases the bones themselves are bruised. A sprain differs from a fracture or a dislocation by the absence of deformity and other characteristic signs.

Treatment.—The joint should be soaked in hot water at once. It should be done properly to be of service. If, for instance, the ankle-joint is sprained, put the foot in a pail of water as warm as can be borne. Every minute or two add hotter water, until the foot will endure no more. Continue this from twenty minutes to half an hour. Remove the foot, rub gently with vaseline or sweet oil, and apply a snugly-fitting flannel roller bandage. If the sprain is of a joint which cannot be treated in this way, apply towels wrung out of hot water and frequently renewed. This will also hasten the disappearance of the discoloration usually attending a

bruise, which is due to capillary rupture and escape of blood into the tissues.

BURNS AND SCALDS.

Burns are caused by dry heat. The degree of heat may be very great, as in white-hot iron.

Scalds are caused by moist heat, as hot water or steam. Unless superheated under pressure, as in an engine-boiler, the temperature is not above 212° F. Scalds are dangerous according to the extent of surface involved. It is said that if two thirds of the surface of the body is scalded, death inevitably follows.

Eschars are burns caused by chemical caustics, such as strong acids or alkalies.

The scars resulting from severe burns possess the property of slow contraction to a remarkable degree. If situated over a joint they may cause serious deformity and loss of mobility, requiring an operation for relief.

There are three degrees of burns :

1. Painful redness, such as results from a slight scald, sunburn, or the use of a mustard plaster.

2. Formation of blisters in addition to redness. First and second degrees involve the skin only.

3. Charring. In this degree the skin is destroyed and the underlying tissues as well, to a greater or less depth.

Treatment.—1. Cut away the clothing. Do not pull it off.

2. Prick blisters with a large new pin or needle, and gently press out the fluid which they contain, being careful not to tear the raised skin, as it leaves a raw, tender surface.

3. Apply cloths wet with á solution of baking soda, as much soda as will dissolve in a cup of water. This is especially good for scalds. Apply on muslin or linen either vaseline, cold cream, olive oil, linseed oil, lard, butter, or carron oil, which is a mixture of equal parts lime-water and linseed oil. If at hand, the best application is a solution of carbolic acid, three teaspoonfuls to one pint of water. Wet cloths with it and lay on burn. It relieves pain by benumbing the nerves of the part. If none of these substances are at hand, dust with flour, starch, or toilet powder.

In burns from a caustic, if made by an acid, apply the solution of baking soda or lime-water. If from an alkali—for example, lye, apply a solution of a teaspoonful of vinegar and two tablespoonfuls of water, or lemon-juice and water, equal parts. Afterward treat it as a simple burn.

FROST-BITES.

Frost-bites are usually of the ears, nose, hands, or feet. At first the freezing part is blue

or purple, and quite painful. After it is thoroughly frozen it looks waxy white, and no pain is felt. The nerves of the part are frozen, and in this condition lose the power of conveying sensation.

Treatment.—Warmth and circulation should be restored gradually. If done suddenly mortification (*gangrene*) is likely to ensue. Put the patient in a cold room. Rub the frozen part vigorously with snow, ice, cloths wet with ice-water, or pour on ice-water. Continue this until a burning, tingling pain is felt in the part, when all active treatment should cease. Pain shows that warmth and circulation are beginning to return. Cloths wet in cold water should then be bound upon the part. The after effects of a frost-bite are precisely like those of a burn, and require similar treatment.

DROWNING.

Immersion even for one minute has destroyed life. On the other hand, pearl and sponge divers remain under water for two and three minutes, having acquired such ability by continued practice.

There are two kinds of cases met with. In the first as soon as the person falls into the water, a condition which resembles fainting ensues. The heart beats very feebly. The breathing stops, and no water is drawn into the air-

passages. Restoration to life is more probable than in the second kind, where fainting does not occur, and in an attempt to breathe while immersed, water is drawn into the windpipe and lungs.

There are certain things which are of great importance to remember if any one is in danger of drowning, always provided that they can retain self-control and presence of mind. The body, as a whole, is lighter than water, and will float if the arms and greater part of the head remain under water. Therefore if any one is in this danger, he should lie flat on the back, keep the arms under water, stretched full length above the head, expire and inspire quickly, holding the air in the lungs after inspiration as long as possible, so as to keep them filled during the greater part of the time. Then wait quietly for assistance. Struggling and throwing the arms out of water will cause the person to sink.

RULES FOR THE TREATMENT OF THE APPARENTLY DROWNED.

Never stop working until a physician pronounces the case hopeless.

Remember that the patient is suffering from two things—want of air or oxygen, and loss of heat from the body. Want of oxygen is the pressing need which must be supplied, therefore if the patient is not breathing, artificial respira-

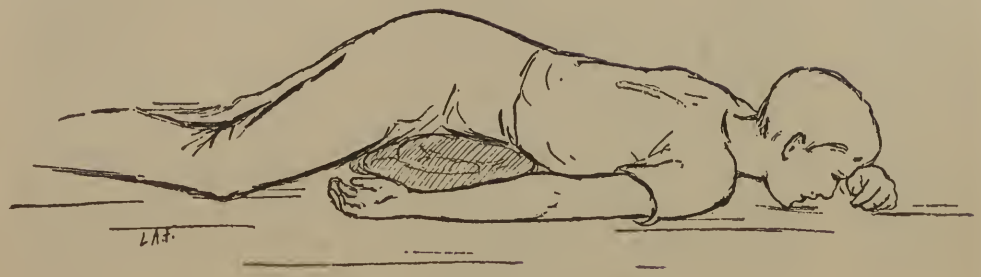

FIG. 9.

Letting water run out of lungs and windpipe. Note that mouth is lower than base of lungs. Also forehead resting on hand.

tion should be commenced and continued, first, last, and all the time. Begin and carry on your work in the following order :

1. Cut and tear the clothing from the upper part of the body, to give freedom of movement.

2. Keep in the open air, if the weather permits.

3. Turn the body on the face, forehead resting on hand to keep mouth clear of ground. Place a coat or two, made into a roll, under stomach and hips, in order to have a sloping line from base of lungs to mouth. In absence of roll, stand astride of patient, grasp hips and raise high. This will allow water to run out of the windpipe. Assist it by placing a hand on each side of spine at back of chest and pressing forcibly two or three times. (See Fig. 9.) Let this occupy not more than one minute.

4. Turn body on the back. Place roll of clothing under the shoulders. The roll may be dispensed with, if not procurable.

5. Wrap handkerchief around forefinger, pass into the mouth and clear out mucus. Grasp tip of tongue and draw it forward and down on chin. Have some one hold it there, or, if alone, lay a strip of material on tongue, pass the ends behind the neck and tie. Otherwise the tongue may fall back and close the throat.

6. Then begin artificial respiration (Sylvester's method). Kneel at patient's head.

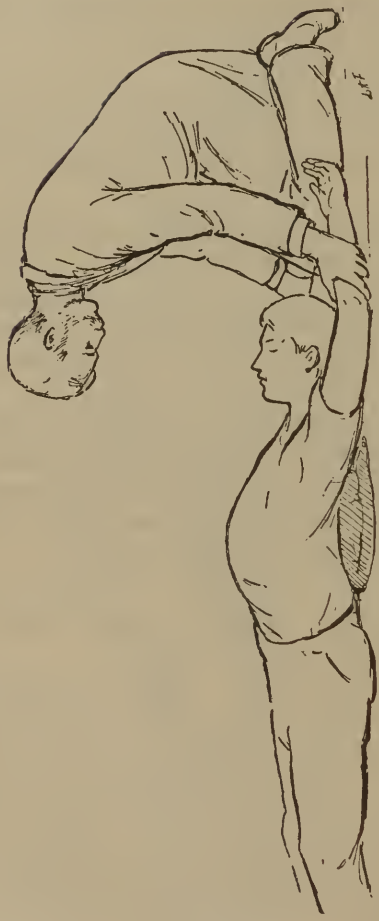

FIG. 10.

Artificial respiration. First movement—inspiration.
Note expansion of chest, and elbows touching the ground.

First Movement (*Inspiration*).—Grasp arms at or just below the elbows. Bring the arms up over head and down to the ground, so that the *elbows touch the ground.* Hold them there for three seconds, or while you count one, two, three, rather slowly. The muscles attached to the upper arm-bone and to the ribs, pull upon the latter so as to expand the chest, and air enters the lungs. (See Fig. 10.)

Second Movement (*Expiration*).—From this position carry arms down so that the elbows rest one upon either side of the front of the chest. Let the weight of your body bear upon the chest and ribs, while you count one, two, three, rather slowly, as if you were endeavoring to squeeze the air out of the lungs, which is, in fact, precisely what you wish to do. (See Fig. 11.)

The preceding points are the most important. But the patient is also suffering from loss of heat, therefore, if you have others to aid you,

7. Send for warmed blankets and quilts, bottles or rubber bags filled with hot water ; for bricks, stones, bags of sand or salt, heated in the oven.

8. Send also for brandy, whiskey, wine, or aromatic spirits of ammonia, to be used when patient can swallow.

9. While you are continuing artificial respiration, let others remove the remaining wet clothing, apply heat by methods referred to, and rub the limbs vigorously upward.

FIG. 11.

Artificial respiration. Second movement—expiration. Note pressure upon, and sinking in of chest.

10. From time to time stop artificial respiration for a moment, in order to see whether the patient is himself attempting to breathe. Change of color in the face, gasping, or movement of the pit of the stomach, are favorable signs. If he begins to breathe do not hinder him by squeezing air out of the lungs when he is making an effort to get it in. Slap the bare chest with a towel wet in cold water, or, better, pour hot and cold water alternately on the chest. Either of these will stimulate the breathing, as any one who has gasped under a cold shower-bath will testify. In addition apply smelling salts or ammonia to the nostrils.

11. As soon as the patient can swallow, give stimulants in hot water and remove him to bed.

In all cases of apparent drowning continue your efforts for at least two hours, or until the responsibility is shifted upon a physician.

SUFFOCATION FROM GAS.

Usually caused by ordinary illuminating gas, but sometimes by the vapor produced by burning charcoal in a closed room. In these cases the patient is suffering not only from want of oxygen, but from poisoning of the blood produced by absorption of gas. The heat of the body is not lost to the same extent as in drowning.

Treatment.—Give fresh air. Open all doors,

and raise or break windows from the outside, if possible. If not, open the door, cover your mouth and nose with a towel wet in water, or water and vinegar. Rush to the nearest window, break a pane, thrust your head out, and take fresh breath. Repeat at the other windows. As soon as possible remove the patient to fresh air.

1. *If the patient is breathing*, slap the chest with a cold wet towel, or pour hot and cold water alternately on the bare chest. Let him inhale the fumes of ammonia, or burn feathers under the nose.

2. *If the patient is not breathing*, perform artificial respiration.

Wrap a hot plate in a towel and lay over heart. As soon as the patient can swallow, give stimulants in hot water.

FOREIGN BODIES.

In Throat.—Choking is usually caused by pieces of food lodging in the throat, or entering the cartilaginous box (*larynx*) at the upper end of the windpipe (*trachea*). Death may occur suddenly from the latter cause.

1. If a child, invert at once, by seizing the ankles and suspending the child thereby, head downward. While holding him in this position slap the back violently, so as to dislodge the foreign body.

2. If an adult, slap the back violently.

If these means are unsuccessful, then, either in a child or an adult,

3. Seize the nose. Open the mouth and keep it open by thrusting between the teeth the handle of a table-knife, spoon or fork, a pencil, stick, cork, or similar hard substance. Then pass two fingers to the back of the mouth, press the tongue down, and either crook the fingers and try to hook out the foreign body, or grasp it between the fingers and extract it. This proceeding will cause an attempt to vomit which aids in the dislodgment.

If these means are ineffectual and the necessary assistants are at hand an adult also may be inverted. Place him face downward upon a table, bureau, or desk, slide his head and body over the edge until the trunk and head hang vertically, head downward, letting your assistant sit on the legs of the patient to keep the latter from falling off. Then slap the back violently.

In a case of this kind it is especially important in sending for a physician, to acquaint him with its nature, as instruments of a special kind are required for its treatment.

In Eye.—1. If the foreign body is corrosive or caustic, as, for example, acids, bits of lime or mortar, the eyes should be freely bathed with a solution suitable for counteracting (*neutralizing*) its caustic property.

For alkalies—lime and mortar—use a mixture consisting of one teaspoonful of vinegar to two tablespoonfuls of water. Lemon-juice in same proportion.

For acids, use mixture of baking soda, half a teaspoonful to a cup of water.

2. If the foreign body is not corrosive, as sand, dust, or cinders, do not rub the eyes. Simply close them for some time, and in many cases the free flow of tears will wash out the foreign body. It will most commonly be found on under lid, or inner corner of the eye. If it can be seen by holding the eyelids apart, remove it by means of a corner of a handkerchief rolled to a point. If there is difficulty in its removal always consult a physician or specialist in diseases of the eye.

In Nose.—there is no danger except from unskilful removal. Consult a physician.

In Ear.—The same advice, to consult a physician, holds good in this accident, with one exception. If an insect has entered the ear, pour oil or water into the ear-opening, thus drowning or floating out the intruder.

CONVULSIONS.

1. In adults. These are due to various causes, for example, epilepsy or Bright's disease of the kidneys. A true convulsion cannot be stopped after it has once begun. The only thing

that can be done is to prevent the patient from injuring himself. The most usual self-injury is biting the tongue and inside of cheeks. Avoid this by placing between the teeth a cork, or the handle of a knife wrapped in a handkerchief. Use either no restraint, or be very gentle.

2. In children. These are generally due to indigestion, or indigestible food. They occur also at the beginning of, and during the eruptive fevers, for example, scarlet-fever.

Treatment.—Put the child in a warm bath as soon as possible. The warmth soothes and quiets the nervous system. If the face is flushed and the head hot apply to the latter cloths wrung out of cold water. If the face is pale do not use cold. The physician should direct any further treatment.

CROUP.

There are two forms of disease usually called by this name—membranous croup and spasmodic croup. The former is almost invariably diphtheritic in its character, and as it requires a period of time counted by days for its full development, it does not belong to the catalogue of emergencies.

Spasmodic croup comes on suddenly. A child retires to bed apparently well, or with slight symptoms of a cold. Usually between ten and twelve o'clock at night it wakes suddenly from

a sound sleep, with difficult, wheezy breathing, hoarse voice, and loud, ringing, so-called croupy cough. It is very seldom, if ever, fatal.

Treatment.—Get some hot water, dip in it a small sponge, or a handkerchief rolled into a ball, squeeze it once and hold it upon the front of the throat just over what is called the "Adam's apple" (*larynx*), and repeat. Continue this for ten or fifteen minutes, or until the skin is well reddened. In the mean time, if possible, prepare a warm bath and put the child in it. The hot applications and the warm bath relieve congestion and quiet the nervous system, thus relaxing the spasm of the small muscles at the top of the windpipe. The treatment by medication must be directed by the physician.

UNCONSCIOUSNESS.

Unconsciousness is, technically, the loss of sensation and voluntary motion. It may be due to a variety of different causes, besides those already referred to. It is consequently very difficult at times, even for the physician, to determine the exact cause in a given case. To illustrate this fact it is sufficient to say that loss of consciousness may be caused by fainting, apoplexy, intoxication, sunstroke, epilepsy, hysteria, condition of blood in Bright's disease of the kidneys; inflammation, injury, compression

and concussion of the brain; fracture of the skull, and narcotic poisons.

Treatment.—There are certain general rules of treatment which may be followed in any case, without reference to the cause of the condition.

1. Give fresh air. Prevent crowding around the patient.

2. Loosen clothing around neck and chest, so that the breathing may not be hindered.

3. If the face is pale, keep the head low.

4. If the face is flushed, raise the head, and apply cloths or towels wetted with cold water.

5. Do not give stimulants, unless it is undoubtedly a case of fainting.

6. Obtain all possible information about the case, for it will be of great value to the physician. For example, injury of any kind to head, exposure to heat, or the fact of a convulsion having preceded loss of consciousness.

There are some of these cases which it will be of service to describe a little more fully, in relation to their symptoms and treatment.

Fainting.—If the brain stops acting the person becomes unconscious. To keep the brain in action, it needs a constant supply of blood. If this supply of blood is cut off the person faints —that is, becomes unconscious. The heart is sometimes a very susceptible organ. Any sudden and strong sensation, mental or physical,

painful or the reverse, will at times cause an abrupt weakening of its action. Thus the blood-supply to the brain is stopped for the time, and the person becomes unconscious and sinks in a faint.

Treatment.—Lay the patient flat upon the back. The floor will answer admirably. Do not lift him or her to a lounge or bed. As the faint is due to absence of blood from the head, the object of treatment is to get it back to the head. By making the head the lowest point of the body, the force of gravity will give powerful aid in sending it where it is needed. Do not use a pillow ; it is a hindrance. Keep the head low. At the same time loosen the clothing around the neck, sprinkle cold water on the face, and chafe the hands vigorously. Apply ammonia or smelling salts to the nose, and if the faint continues raise the feet higher than the head. A sudden loss of consciousness, which is not soon relieved by these means, and especially if the face is flushed rather than pale, is more than a mere faint.

Sunstroke.—A condition produced by exposure to heat. The greatest number of cases develop on and after the third day of a heated term. There are certain symptoms premonitory of this accident, such as headache, a feeling of weakness, disturbance of the sight, nausea, and, perhaps, vomiting. These symptoms increase in severity until the person becomes uncon-

scious. The face is flushed. The skin is intensely hot and dry. If the temperature of the body is taken by a thermometer it may be found as high as 112°. In ordinary fevers if the temperature rises to 105° or 106°, it is considered a very severe case. This statement is made in order to strongly emphasize the fact, that the patient is suffering from an excess of heat in the body. It is exceedingly important that this excess of heat should be removed as soon as possible. Even minutes are valuable. Hence, the following

Treatment.—Send for a physician. If the patient is in a room or other place sheltered from observation, strip off all clothing. Pour cold or ice-water over the whole body from a pitcher, or preferably, sprinkle it from a watering-pot. On the head place towels wrung out of ice-water and frequently renewed, or cracked ice wrapped in a cloth. Continue this treatment until the physician arrives, or the patient begins to show signs of consciousness. If the patient is found in a public place, loosen clothing around neck, and dash cold water over face and chest. Remove as soon as possible to a retired and quiet place. Do not give stimulants.

Heat Exhaustion.—This is another but much less serious form of illness from heat. It is usually caused by physical overwork during hot weather in badly-ventilated rooms. Factory girls are especially liable to heat exhaustion. It

is not true sunstroke, for the temperature of the body is very slightly elevated. It resembles fainting more than sunstroke. By way of treatment nothing is required but rest in a cool room, and the giving of one or two teaspoonfuls of brandy, whiskey, or wine.

Epilepsy.—The obvious symptoms of epilepsy consist of a convulsion lasting two or three minutes, followed by a half hour or less of unconsciousness, which gradually passes off. The treatment consists in preventing self-injury (see section on convulsions), and in letting the patient alone during his unconscious period.

SHOCK, OR COLLAPSE.

This is a condition occurring to a greater or less degree in all injuries and accidents. It varies in intensity from a slight and momentary feeling of weakness, to a condition of great danger, in which the patient is cold, pale, and unconscious, with a slow and hardly perceptible pulse.

Treatment.—In cases severe enough to require it, the treatment should consist principally in the application of warmth by hot bottles, etc. A small amount of stimulant may be given.

POISONING.

A poison is any substance which, if taken internally in sufficient amount, will cause death.

As a matter of practical importance poisons are divided into two classes, irritants and narcotics.

Irritant poisons are substances which will corrode and burn the skin or flesh with which they come in contact, for example, strong acids or alkalies. In other words, they destroy, to a greater or less depth, all the tissues of the body which are touched by them. The effects of an irritant poison are evident immediately after it is taken. The symptoms consist of a burning pain in the mouth, throat, stomach, and abdomen, followed by nausea and vomiting. Faintness and shock are also present in varying degrees.

On the other hand, in *narcotic poisoning*, the symptoms come on more slowly. Take an overdose of laudanum, for example. It is a preparation of opium. After taking it, a period of fifteen to twenty minutes will elapse before any effect is perceived. The person then begins to be drowsy. The drowsiness gradually increases, until it results in a profound sleep or stupor, from which the patient can be aroused with difficulty, if at all. This shows the difference in the two kinds of poisoning.

With irritants the effects—pain, vomiting, and shock—appear immediately.

With narcotics the effects—usually drowsiness and stupor, no pain—are comparatively slow in making their appearance.

There are some substances which have both irritant and narcotic properties in differing proportions. In poisoning from such substances, the symptoms are of a mixed character.

TREATMENT OF POISONING.

1. *If you know the poison and also its antidote*, give the antidote at once. An antidote is a substance which will either combine with the poison to form a harmless compound, or something which will have a directly opposite effect upon the body, thus counteracting the influence of the poison. After administering the antidote the case falls under the following rules :

2. *If the poison is known and its antidote has been given*, or,

If the antidote is not at hand and procuring it would cause delay, or,

If the poison is unknown,

Cause vomiting as quickly as possible, so as to remove the poison from the stomach. The means by which this may be accomplished are as follows : Stir in a tumbler of water a tablespoonful of mustard, or salt, and make the patient swallow the whole. It will usually be quickly rejected, bringing the contents of the stomach with it. Two or three teaspoonfuls of the syrup of ipecac will have a similar effect. If none of these are at hand *compel* the patient to drink lukewarm, or even cold water until vomit-

ing occurs. If the case is one of attempted suicide it may be necessary to open the mouth by force, and keep it open by inserting between the teeth a cork, or the handle of a table-knife. Then thrust the finger down the throat and hold it there until the patient vomits.

After vomiting has been caused you should give to aid it, and also to protect and soothe the walls of the stomach, one or more of the following substances: Milk, uncooked white of egg stirred up in water, flour and water mixed, gruel, boiled starch, or oil. The last should not be given in phosphorus poisoning.

SPECIAL POISONS AND THEIR ANTIDOTES.

This list includes only the more common poisons.

ACIDS.—Nitric, muriatic or hydrochloric, sulphuric and oxalic, *excluding carbolic acid.*

Antidotes.—Baking soda, a teaspoonful in a cup of water. Lime-water, as much as the patient can swallow. A teaspoonful of magnesia, whiting, chalk, tooth-powder, or lime scraped from a plastered or white-washed wall, stirred into a cup of water. A tablespoonful of strong soap-suds.

ALKALIES.—Lye, soft soap, various washing fluids and powders, strong ammonia, or harts-horn.

Antidotes.—A tablespoonful of vinegar in a cup of water. The juice of two lemons, with an equal quantity of water. The juice of two oranges may be given, if the others are not at hand. Acids and alkalies combine to form harmless *salts*, or, in other words, they neutralize each other. Oil—olive or salad, linseed, and castor, form harmless *soaps*.

ARSENIC.—Some rat and fly poisons.

Antidote.—A preparation of iron freshly made. Send to nearest druggist for "Antidote to Arsenic."

CARBOLIC ACID.—This is not a true acid.

Antidote.—There is no chemical antidote. Give oil freely, olive or salad, linseed or castor.

IODINE.—The most common preparation is the tincture, or "iodine paint."

Antidote.—*Boiled* starch. Laundry or corn-starch, arrow-root, boiled or baked potatoes.

LEAD.—Sugar of lead in some lotions and hair-dyes. Paint containing white lead.

Antidote.—Epsom salts, a tablespoonful in tumbler of water.

MERCURY.—The most common poisonous preparation is "corrosive sublimate," used to kill insects and as a disinfectant.

Antidote.—Uncooked white of egg forms a comparatively harmless chemical compound.

OPIUM.—Common preparations; morphine,

laudanum, paregoric, many cough medicines and soothing syrups.

Antidotes.—Opium poisoning is so common that it is more fully noticed here. There is no chemical antidote for opium, but strong coffee, pain, and motion counteract its effects. The patient may breathe very slowly; the pupils or round dark centres of the eyes will be very small—the so-called "pin-hole pupil." Give with the emetic, or as soon after as possible, large quantities of strong black coffee. Keep the patient awake by forced walking. Whip the back and legs with a light cane, or a slipper, or strong twig, so as to produce a smarting pain. Dash cold water on face and chest at intervals. Finally, if the breathing becomes very slow, only five or six times per minute, perform artificial respiration.

PHOSPHORUS.—Some rat pastes, which have a strong odor. Matches.

Antidote.—Common turpentine, which has been exposed to the air for some time, mixed with magnesia. Send to druggist. Do not give oil, as it favors the action of this poison.

SILVER.—Nitrate of silver, sometimes called lunar caustic. Frequently used in solution as a local application.

Antidote.—Common salt. A teaspoonful in a cup of water.

TRANSPORTATION OF THE SICK AND INJURED.

It is frequently necessary in small towns or country districts, to carry a sick or injured person some distance to a house, or a hospital where he may receive medical aid. In large cities, possessing a well-organized ambulance service, the necessity for such transportation is not so often felt. It is, however, not infrequently required to move a sick person from room to room, or floor to floor of a house. As the same means are appropriate, whether the distance be long or short, it is thought best to describe the most approved improvised methods of transportation. The best methods are those which disturb the patient as little as possible, thus saving his strength, and preventing further damage if he is suffering from an injury. These methods vary. The available number of bearers, the consciousness or unconsciousness of the patient, and his consequent ability or inability to aid his helpers, are some of the circumstances which influence the choice of methods.

If You are Alone.—In the case of a child, it may, of course, be carried in the arms in the usual way. In an adult,

1. If conscious and able to walk feebly, you may render efficient aid. Stand, say, at his left side. Pass his left arm around your neck. Grasp his left wrist with your left hand. Then

FIG. 12.

pass your right arm around his waist and take hold of his right wrist, unless it or the arm be injured. In the latter case simply hold his waist. (See Fig. 12.)

2. If he is unconscious or unable to walk, prop him in a sitting posture. Kneel facing him. Place your right shoulder against the lower part of his abdomen. Pass your right arm around his legs just at, or above his knees. Let his body fall forward over your shoulder, his head and body hanging down behind you, until he is balanced on your shoulder like a sack of grain. Then rise to your feet. Your left arm will be free. If the patient is too heavy for you to handle, you must either leave him and go for help, or wait until help arrives.

If You have Help.

1. If the patient is conscious and can aid you, stand at his left side, facing your assistant, who stands on the other. Let each of you pass one arm under patient's thighs, the other under and around the small of his back. Then let the patient put an arm around the neck of each of you. Raise him and proceed. (See Frontispiece.)

There are two variations of this method which should be noted.

Instead of passing the arms under the patient's thighs, take a handkerchief, or two handkerchiefs, if one is not strong enough, and tie

the ends firmly together, thus forming a ring. Grasp it on either side and let the wounded person sit on it, as on a round seat. This device renders your task more easy. (See Fig. 13.)

The other modification is to form a so-called "ladies' chair," "sedan chair," or "dandy chair." You and your assistant face each other. Let each grasp his left wrist with his right hand, and then the right wrist of the other with his left hand. This also forms a seat upon which

FIG. 13.

the patient may sit. It is not so good a way as the others, for it gives no support to the patient's back.

2. If the patient is unconscious, let the stronger bearer stand at the patient's head, facing toward the feet. Then let him pass his arms under the patient's arms from behind, and clasp his hands over the latter's chest. The other bearer stands at the patient's feet, facing forward, stoops and passes his arms under the patient's knees from the outside, letting the knees rest in the hollow of his elbows. Then lift the patient and move forward with "broken

step''—that is, *not* keeping step. This will prevent the patient's body swinging from side to side, as it will in the cadenced walk. (See Fig. 14.)

3. No matter what the condition of the patient may be, if help and materials are at hand, you may use an improvised stretcher. A stretcher consists essentially of something upon which the patient may lie, and by which he may be carried.

An improvised stretcher for two bearers may consist of a board, a window-shutter, a door. Poles may be thrust through the sleeves of two or more coats and the coats buttoned. The bearers take hold, one at each end.

An improvised stretcher for four bearers may consist of a shawl, a blanket, a quilt, or a rug, upon which the patient is laid. The bearers stand, one at each corner, grasp the fabric, and raise it. At a pinch two bearers, one at each side, may answer.

Personal ingenuity and resources count for much in tasks of this kind, as there are many other articles which may be utilized for such purposes.

Directions for Using Stretchers.—It is best to have three bearers. Two carry the patient. The third watches and attends the injured person, and changes place with one of the others, when the latter is fatigued.

FIG. 14.

To place the patient upon the stretcher, lay it at his head in a line with him. Do not place it at his side, for the bearers may stumble and fall over it. The two bearers, one at each side of the patient, pass their arms under his thighs and back, lift him backward over the stretcher and lay him on it. During this time, if a limb is injured, the third bearer holds and steadies it. The two bearers take hold of the stretcher, one at the head, and one at the foot, both facing in the direction they wish to go. Walk with broken step—that is, do *not* keep step. Carry the patient feet foremost, except in going up-hill. If a leg is broken, go feet foremost up hill, and head foremost down hill, so as to prevent the weight of the body pressing upon the limb.

MATERIALS WHICH MAY BE USED FOR COMPRESSES, DRESSINGS, AND BANDAGES.

Always, if possible, use *clean* material, fresh from the store or laundry, and not that which is soiled by wearing or handling. This advice applies mainly to the treatment of recent wounds. The reason why is explained in the section on treatment of wounds. Of course in pressing emergencies this advice must needs be disregarded.

Whether the material be clean or soiled, and especially in the latter case, wet it whenever

possible in one of the antiseptic solutions of carbolic acid, vinegar, or salt.

Materials for Compresses.—One of the best is cheese cloth. It is usually not available in emergencies, because it requires a little preparation before it is ready for use. But it is an excellent thing to keep on hand, and is prepared as follows: Procure two yards of cheese-cloth. Fold it *loosely* into a convenient-sized packet, and tie a string, also loosely, around the middle. Boil it in water, with a little washing soda added, for fifteen or twenty minutes. Then rinse in clean water several times to remove the soda. Boiling makes it soft and absorbent like a sponge. Hang it up to dry, still tied, in a place free from dust. Untie it, shake it out, and fold it over and over until it is of a convenient size for laying away. Compresses, bandages, etc., are best kept in a tin box, to protect them from dust and dirt. When required for use a piece of proper size, and of eight to twelve, or more, thicknesses can be cut off with scissors. It is better to have a compress too thick and too large, than to go to the opposite extreme.

In emergencies a variety of materials may be used for compresses, such as clean handkerchiefs, piece of muslin or linen, or strips of white clothing. Toilet paper, or even newspaper, torn into strips and crumpled into the shape of a small pillow, makes an excellent compress.

The same materials serve for making applications to burns, etc.

For bandages, the most common material is unbleached muslin of the cheapest grade. Bleached muslin and the higher grades are either too stiff or too thick for convenience in applying.

In emergencies one of the following may be employed for bandages: Handkerchiefs used as triangular bandages, sheets, blankets, and clothing torn into squares and afterward folded into triangles. The same, torn in strips. Garters, stockings, or suspenders.

BANDAGES IN GENERAL.

Bandages are used to retain and protect dressings or splints, and to make pressure upon or give support to any part of the body.

There are two kinds of bandages: The triangular or handkerchief bandage and the roller bandage.

(*It is important that the various modes of bandaging should be learned and practised under the guidance of a competent person.*)

The triangular bandage is the most useful for emergencies, as it may be readily improvised. It is also possible to learn its use from illustrations and printed directions, which will be given. The roller bandage is the kind which is universally employed by physicians. It is much better and more generally useful than the tri-

angular bandage. It is frequently of great service in home emergencies and surgical illness. Therefore it is well to seek personal instruction in its various modes of application. It is well-nigh impossible to obtain the necessary skill of hand from illustrations and printed directions, until at least its elementary principles have been acquired. It thus differs to some extent from the triangular bandage.

THE USE OF THE TRIANGULAR BANDAGE—THE BANDAGE FOR EMERGENCIES.

Take a piece of unbleached muslin varying from twenty-four to forty inches square, according to the part of the body for which it is to be used. Cut it into triangular halves, or use a large handkerchief folded into a triangle.

The longest border is called the *base*. The corner opposite the base is termed the *point*, and the other corners, the *angles*. (See Fig. 15, X.)

To fold when not in use.—Place the angles together and fold on a line running from base to point (Fig. 15, X), thus (Fig. 15, Y) forming a smaller triangle, A P B. Then bring the angles A and the point P to the centre of the base B, at the end of the line made by the first folding, forming a square, F E B G. Fold the square through the line C D, forming an oblong, C D B E. Continue folding until of convenient size and shape for putting in box or pocket.

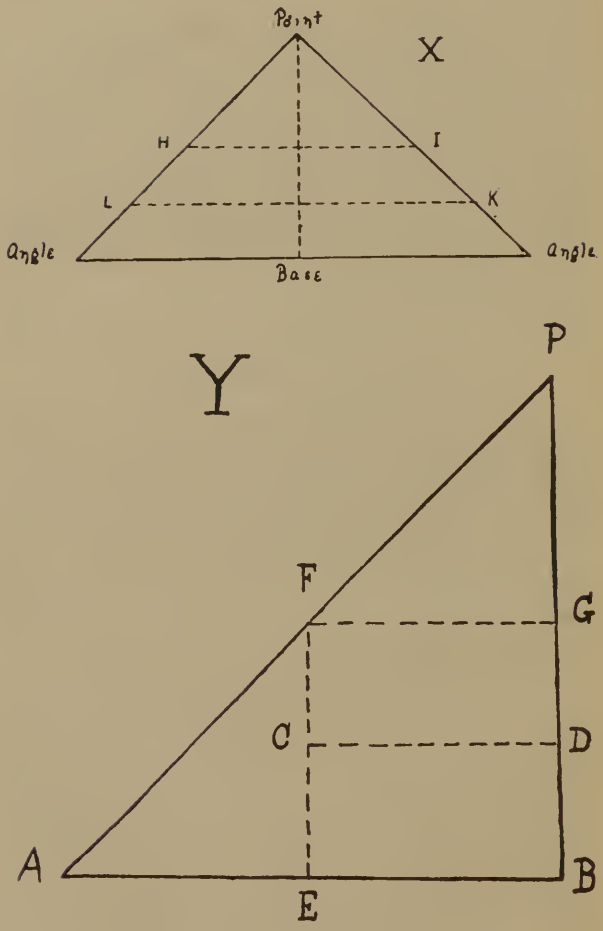

FIG. 15.

It may be used as,

1. A triangle, unfolded to its full extent.

2. A cravat, broad or narrow. Unfold it and lay it flat, base toward you. (See Fig. 15, X.) Bring point down to centre of base, folding it along the line H I. Then fold it lengthwise toward you along the line L K, twice for a broad, or three times for a narrow bandage.

3. A cord. A cravat twisted. Used as an improvised tourniquet. (See Fig. 16, left arm.) The poorest way of fastening a bandage is to tie or knot the ends. The next best way is to use pins. The best way is to fasten it with a few stitches. The pressure of the knot is sometimes painful, the pins may prick, but the stitches are open to neither of these objections.

Manner of using.

Broad Arm-sling.—Take a triangle. Place wrist on centre of base, point toward elbow. Pass angles around neck and tie, or pin. Fold point around elbow and pin. (See Fig. 8, left arm.)

Narrow Arm-sling.—Fold like a cravat. Lay wrist on centre. Tie or pin ends around neck.

Head Bandage.—Triangle. Lay base on forehead. Carry angles round and tie at back of head. Carry point back over top of head, under knot, then forward over knot to top of head and fasten. Always place centre of triangle on the

FIG. 16.

FIG. 17.

place which it is wished to cover. It is not so good a method as the following :

Head, Face, and Chin Bandage.—Cravat. Place centre of cravat on wounded point. Carry ends around head or neck and tie. For instance, forehead : Lay centre on forehead, tie at back of head. (See Figs. 16, 17, head.) Back of head, tie over forehead. Side of head, tie on opposite side. Top of head, tie under chin. Chin, tie on top of head. Eyes, one or both, tie at back of head. Nose and upper part of cheek, tie at back of head. Mouth, and chin just under mouth, tie at back of head, or back of neck.

Neck Bandage.—Cravat around neck. (See Figs. 16, 17, neck.)

Shoulder Bandage.—Two bandages, a cravat and a triangle. Tie cravat around neck. Lay centre of base of triangle on outside of shoulder or upper arm. Carry angles completely around arm and tie on outside of arm. Carry point up under cravat, then over and down to point of shoulder, where it should be fastened. (See Figs. 16, 17, right shoulder.)

Arm and Forearm Bandage.—Use a cravat wound around arm at any desired point between shoulder and wrist. (See Figs. 16, 17, right elbow.)

Hand and Wrist Bandage.—Triangle. Lay front of wrist and palm of hand on centre of base of bandage, fingers toward point. Bring

point over ends of fingers to back of wrist. Fold angles, first one then the other, over back of hand, around wrist, and tie on back of wrist. (See Figs. 16, 17, right hand.)

Chest, or Back Bandage.—To cover chest. Triangle. Place centre of base on lower part of chest, point toward neck. Carry angle on each side around chest and knot on back, leaving one end of knot much longer than the other. Carry point over either shoulder and tie to long end of knot. To cover back, place centre of base on back and knot over chest. (See Figs. 16, 17, chest, over left shoulder.)

Chest and Waist Bandage.—Broad cravat. Pass around chest, or waist and tie.

Hip Bandage.—Narrow cravat and triangle. Tie cravat around waist. Place centre of base of triangle on outer side, upper part of thigh, point upward. Pass angles completely around thigh and knot on outside. Pass point under waist cravat, bring it down and fasten on outer side of hip. (See Figs. 16, 17, left hip.) To cover both hips use two triangles, one on each side.

Thigh and Leg Bandage.—Cravat, broad or narrow. Wind around thigh or leg at any desired point between hip and ankle. (See Figs. 16, 17, right leg.)

Foot and Ankle Bandage.—Triangle. Place the heel on the centre of base, toes toward point.

Bring point upward over toes to instep. Take angles forward, cross them on instep, pass completely around ankle and tie in front over ankle. (See Figs. 16, 17, right foot.)

THE ROLLER BANDAGE.

The roller bandage consists usually of a long and narrow strip of unbleached muslin, rolled from one end into a cylinder, or *roller*. Cheesecloth and other thin cotton fabrics are sometimes used, for special cases, when some expertness has been acquired in its use.

The dimensions of the roller bandage for different parts of the body are as follows, varying according to the age and size of the subject :

Part.	Width.	Length.
Fingers	¾ to 1 inch	1 yard.
Arm	2 to 2½ inches	3 to 6 yards.
Leg	2½ to 3 inches	6 to 8 yards.
Chest	4 to 5 inches	8 to 12 yards.
Head	2 to 2½ inches	4 to 6 yards.

The greater part of these may be prepared by tearing a piece of muslin, six yards long, into strips of the proper width, and cutting to the proper length. Selvedge edges must be removed, as otherwise they will cut the flesh like a string.

Points which should be studied :

Elements of Roller Bandaging.—Circular, spiral, and spiral reversed. The figure-of-eight, or crossed bandage for joints.

Special Bandages.—Circular bandage of the head and neck.

Four-tailed bandage of the head and chin. (See Fig. 8, chin and head.)

Figure-of-eight bandage of the shoulder.

Spiral bandage of the chest.

Spiral bandage of the fingers and thumb.

Figure-of-eight bandage of the wrist and elbow.

Spiral reverse bandage of the arm.

Figure-of-eight bandage of the ankle.

Spiral reverse bandage of the leg.

THINGS TO BE PERSONALLY PRACTISED AND STUDIED.

On the Living Model.

Location of heart.

Location and course of main arteries.

Points for pressure of arteries.

Manner of making pressure on wounds.

Preparing and applying compresses.

Art of applying triangular and roller bandages.

Application of improvised tourniquet.

Practice of artificial respiration.

Preparing and applying improvised splints.

n the Skeleton.

Size, shape, and relation of bones. Joints.

INDEX.